CS107, Lecture 1
Welcome to CS107!

reading:

Course Syllabus

Bryant & O'Hallaron, Ch. 1 (skim)

Honor Code and Collaboration Page

Plan For Today

- Introduction
- CS107 Course Topics
- CS107 Course Policies
- Unix and the Command Line

Asking Questions

- Feel free to raise your hand at any time with a question
- If you are more comfortable, you can post a question in the Ed forum thread for each day's lecture (optionally anonymously)
- We will monitor the thread throughout the lecture for questions

Visit Ed (or access via Canvas):
https://edstem.org/us/courses/38542/discussion/

Today's thread:
https://edstem.org/us/courses/38542/discussion/2880579

Guiding Principles For In-Person Class

- We are likely not fully recovered or restored from the stresses of the past 36+ months and now facing new uncertainties, responsibilities, and emotions.
- We will do everything we can to support you. We have designed the course to the best of our ability to provide flexibility.
- We will constantly evaluate and listen to ensure the class is going as smoothly as possible for everyone.
- Please communicate with us if any personal circumstances or issues arise! We are here to support you.

Guiding Principles For In-Person Class

- Stanford University is currently strongly recommending the use of masks in classrooms and instructional spaces. We strongly encourage you to wear a mask in lecture, section and helper hours.
- Some of us have health conditions precluding our ability to wear masks. Students in this situation should work with the **Office of Accessible Education**.
- Some of us might feel more comfortable wearing masks/social distancing even when not required. All of our preferences are reasonable, and it is important that we treat each others' preferences with respect and care.

Plan For Today

- **Introduction**
- CS107 Course Topics
- CS107 Course Policies
- Unix and the Command Line

Teaching Team


Nick Troccoli


Megan Worrel (Head TA)


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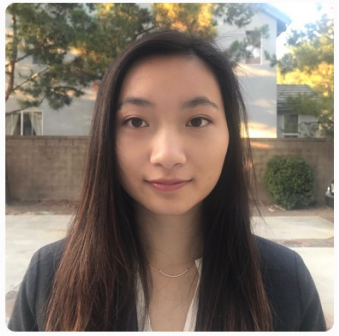
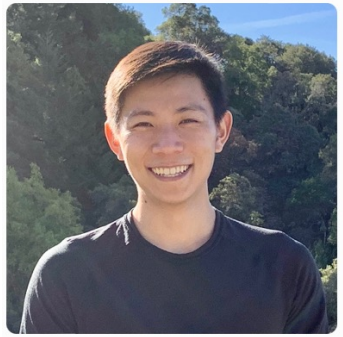
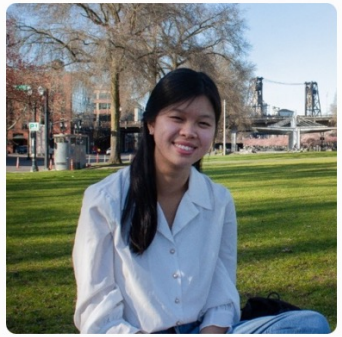
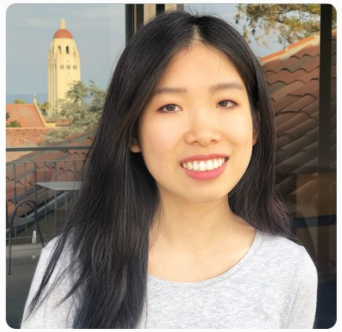
Alex Bradfield


Christine Cheng


Daniel Rebelsky


Jerry Chen


Maia Nguyen


Tori Qiu

About Nick Troccoli (troccoli@stanford.edu):

- Lecturer in CS, taught CS106X, CS107, CS110, CS111
- Stanford BS/MS (coterm) in CS
- Systems track undergrad, AI track grad

Companion Class: CS107A

- **CS107A** is an extra 1-unit “Pathfinders” or “ACE” section with additional course support, practice and instruction.
- Meets for additional weekly sections and has additional review sessions
- Entry by application – see the course website for details: **cs107a.stanford.edu**

Frankie Cerkvenik

Course Website

cs107.stanford.edu

*lecture videos / lecture participation grades on Canvas

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What is CS107?

The CS106 courses (or equivalent) provided you with a solid foundation in programming methodology and abstractions (variables, functions, data structures, pointers, recursion, classes, algorithms).

CS107 follows on this to build up and expand your breadth and depth of programming experience and techniques to show you how machines really work.

CS107 key question: *how / why*?

CS107: How/Why?

The CS106 series taught you how to solve problems as a programmer. CS107 goes a level deeper to understand the **how** and **why**:

- **How** is data in our program really represented?
- **How** does heap memory work?
- **How** does a computer know how to run the code we write?
- **How** does a program map onto the components of computer systems?
- **Why** is my program doing X when I expected it to do Y?

Understanding computing at this level demystifies how these seemingly-complex systems work and can aid future projects you work on.

Course Overview

1. **Bits and Bytes -** *How can a computer represent integer numbers?*
2. **Chars and C-Strings -** *How can a computer represent and manipulate more complex data like text?*
3. **Pointers, Stack and Heap –** *How can we effectively manage all types of memory in our programs?*
4. **Generics -** *How can we use our knowledge of memory and data representation to write code that works with any data type?*
5. **Assembly -** *How does a computer interpret and execute C programs?*
6. **Heap Allocators -** *How do core memory-allocation operations like malloc and free work?*
7. **Ethics, Privacy, Partiality and Trust -** *How do we act responsibly in maintaining security, protecting privacy, and ensuring warranted trust in the systems we build and maintain?*

CS107 Learning Goals

The goals for CS107 are for students to gain **mastery** of

- writing C programs with complex use of memory and pointers
- an accurate model of the address space and compile/runtime behavior of C programs

to achieve **competence** in

- translating C to/from assembly
- writing programs that respect the limitations of computer arithmetic
- identifying bottlenecks and improving runtime performance
- working effectively in a Unix development environment
- using ethical frameworks and case studies to inform decision-making

and have **exposure** to

- a working understanding of the basics of computer architecture

CS107 and Programming Experience

- We hope that CS107 can help further develop your programming experience and comfort with programming.
- CS107 focuses heavily on **debugging** and getting to the root of why something is happening.
- Across assignments, we will be emphasizing how to become a better debugger, how to write better code, and how to further your software development skills.

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- CS107 Course Topics
- **CS107 Course Policies**
- Unix and the Command Line

Course Syllabus and Schedule

cs107.stanford.edu/syllabus

cs107.stanford.edu/schedule

SCPD Students

cs107.stanford.edu/scpd

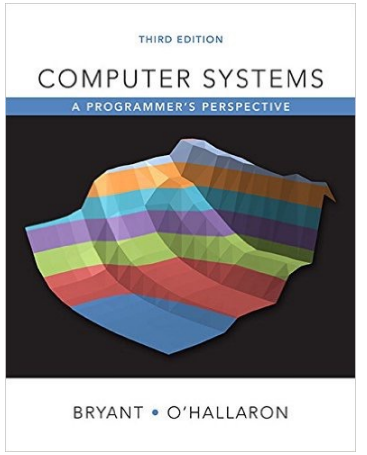
Getting Started Guide

cs107.stanford.edu/getting-started.html

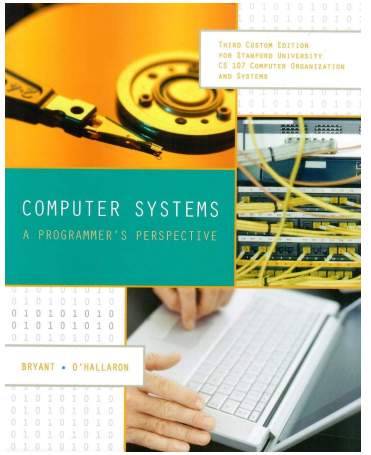
(on course website under ”handouts”)

Textbook(s)

- *Computer Systems: A Programmer's Perspective* by Bryant & O'Hallaron, **3rd Edition**
  - **3rd edition matters** – important updates to content
  - Stanford Library has generously scanned **all** readings for CS107 under "fair use" (private study, scholarship, research). [**Canvas -> Files**]. Please do not distribute.
  - If you want more context, you may want to purchase a full copy
- A C programming reference of your choice
  - *The C Programming Language* by Kernighan and Ritchie (free link on course website Resources page)
  - Other C programming books, websites, or reference sheets



Full textbook



CS107 full chapters

canvas CS107-specific readings

The textbook (and C programming references) are **very** good resources in this course, especially post-midterm!

Course Structure

- Lectures: understand concepts, see demos
- Labs: learn tools, study code, discuss with peers  **Great preview of homework!**
- Assignments: build programming skills, synthesize lecture/lab content
  - **assign0**: due next Monday (covers today and part of Wednesday's lecture)

Grading

******	52%	Assignments
*	8%	Lab Participation
*	5%	Lecture Participation
**	15%	Midterm Exam
**	20%	Final Exam

Read our full course policies document:
https://cs107.stanford.edu/syllabus.html

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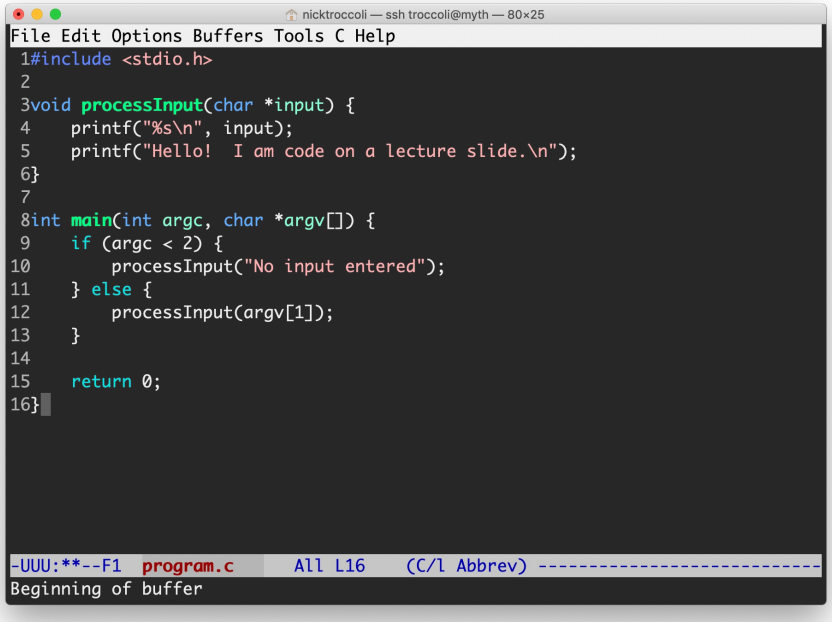
Assignments

- 7 programming assignments completed individually using **Unix command line tools**
  - Free software, pre-installed on Myth machines / available on course website
  - We will give out starter projects for each assignment
- Graded on **functionality** (behavior) and **style** (elegance)
  - Functionality graded using *automated tools,* given as point score – no TA review
  - Style graded via *automated tests* and TA code review, given as bucket score
  - Grades returned via course website



The Style Bucket System

+	An outstanding job; could be used as course example code for good style.
ok	A good job; solid effort, but also opportunities for improvement.
-	Shows some effort and understanding but has larger problems that should be focused on.
- -	Shows many significant issues and does not represent passing work.
0	No work submitted, or barely any changes from the starter assignment.

Assignment Late Policy

- **Start out with 5 "free late days"**: each late day allows you to submit an assignment up to 24 additional hours late without penalty. (No late days permitted for the first or last assignments)
- **Hard deadline 48 hours** after original due date
- Penalty per day after late days are exhausted (1 day: 80% cap; 2 days: 60% cap)
- Late days are "pre-granted extensions" – additional extensions for exceptional circumstances must be approved by the **Head TA**. Please communicate with us! We are here to accommodate you as much as possible.

Question Break!

What questions do you have about the overall course goals, textbook or assignments?

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Lab Sections

- Weekly 1-hour 30-minute in-person labs led by a CA, starting *next* week, offered Wednesdays through Fridays.
- Hands-on practice in small groups with lecture material and course concepts.
- Graded on attendance + participation
- SCPD students have the option to attend a remote section or complete lab work remotely (more info in SCPD Handout)
- Lab preference submissions open **Tuesday 4/4 at 5PM PST** and **are not first-come first-serve**. You may submit your preferences anytime until **Saturday 4/8 at 5PM PST**. Sign up on the course website.

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Lecture Recordings

- Because CS107 is on SCPD (for professional development students) this quarter, the course lectures are recorded and available for later viewing.
- See the calendar page (or lecture dropdown) on the course website for slides and lecture code

Lecture Participation

- At the same time, lecture is an important part of the course and we've found it most effective when students participate in person.
- In each lecture (starting Fri – test run on Wed), we'll use Poll Everywhere to take polls and do practice questions. If you answer all questions in a lecture (regardless of correctness), you get credit for that lecture.
- We will provide **5 pre-excused absences** for when you are ill, in COVID-19 isolation, or have other extenuating circumstances. They are intended only for these scenarios!
- Further excused absences are granted by the **Head TA** only in cases where you have already used your 5 excused absences for extenuating circumstances and further extenuating circumstances necessitate additional accommodations.
- SCPD students have substitute grade component (more details soon)

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Exams

- **Midterm exam** – Tuesday, May 9, 7-9PM outside of class
  - Contact the Head TA by 11:59PM on Friday, April 21 if you have an academic or University conflict with this time, and absolutely cannot make the regularly scheduled midterm
- **Final exam** – Monday, June 12, 3:30PM-6:30PM
  - No alternate final! You **MUST** be able to take the final exam at the scheduled time (except for university athletics or OAE accommodations)

- Both exams are paper exams and are closed-book and closed-notes, but you may bring in 1 double-sided page of notes. You will also be provided with a syntax reference sheet.
- SCPD students have 24hr window during which to take the exams

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Getting Help

- Post on the **Discussion Forum**
  - Online discussion forum for students; post questions, answer other students' questions
  - Best for course material discussions, course policy questions, short debugging questions or general assignment questions (DON'T PUBLICLY POST ASSIGNMENT CODE!)
- Visit **Helper Hours**
  - Chat about course topics or just hang out
  - Sign up in a queue for 1:1 TA help; schedule will be posted on course website tomorrow.
  - Mix of in-person and online helper hours
  - Best for **group work**, **coding/debugging questions (with TAs only!)** or **longer course material discussions**
- **Email** the Course Staff
  - Email instructor/Head TA for **private matters** (e.g. OAE accommodations, extension requests, other personal matters).
  - Email your grader for grading questions about a particular assignment

OAE Accommodations

- Please email the Head TA as soon as possible with any accommodations you may need for the course.
- We are eager to do everything we can to support you and make you successful in CS107!

Course Flexibility

If you are ever sick or encounter an emergency or other exceptional circumstance, we have a variety of accommodation mechanisms, including:

- Assignment late days
- Makeup labs or excused absences
- Lecture excused absences
- Exam accommodations for emergencies/illness
- Ability to attend all helper hours remotely with Head TA permission

If you feel ill or are sick, **please stay home and take care of yourself**. We never want you to feel that you must attend class or helper hours if you are not feeling well. And if you are ill or have another emergency or exceptional circumstance, please reach out to us so that we can help!

Question Break!

What questions do you have about labs, lecture or exams?

Stanford Honor Code

- The **Honor Code** is an undertaking of the students, individually and collectively:
  - that they will not give or receive aid in examinations; that they will not give or receive unpermitted aid in class work, in the preparation of reports, or in any other work that is to be used by the instructor as the basis of grading;
  - that they will do their share and take an active part in seeing to it that others as well as themselves uphold the spirit and letter of the Honor Code.

- The faculty on its part manifests its confidence in the honor of its students by refraining from proctoring examinations and from taking unusual and unreasonable precautions to prevent the forms of dishonesty mentioned above. The faculty will also avoid, as far as practicable, academic procedures that create temptations to violate the Honor Code.

- While the faculty alone has the right and obligation to set academic requirements, the students and faculty will work together to establish optimal conditions for honorable academic work.

see also: http://honorcode.stanford.edu/

It is your responsibility to ensure you have read and are familiar with the honor code guidelines posted on the main page of the CS107 course website. Please read them and come talk to us if you have any questions or concerns.

Honor Code and CS107

- Please help us ensure academic integrity:
  - Indicate any assistance received on HW (books, friends, etc.).
  - Do not look at other people's solution code or answers
  - Do not give your solutions to others or post them on the web or our Ed forum.
  - Report any inappropriate activity you see performed by others.
- Assignments are checked regularly for similarity with help of software tools.
- If you need help, please contact us and we will help you.
  - We do not want you to feel any pressure to violate the Honor Code in order to succeed in this course.
  - If you realize that you have made a mistake, you may retract your submission to any assignment at any time, no questions asked, up to the start of the final exam.

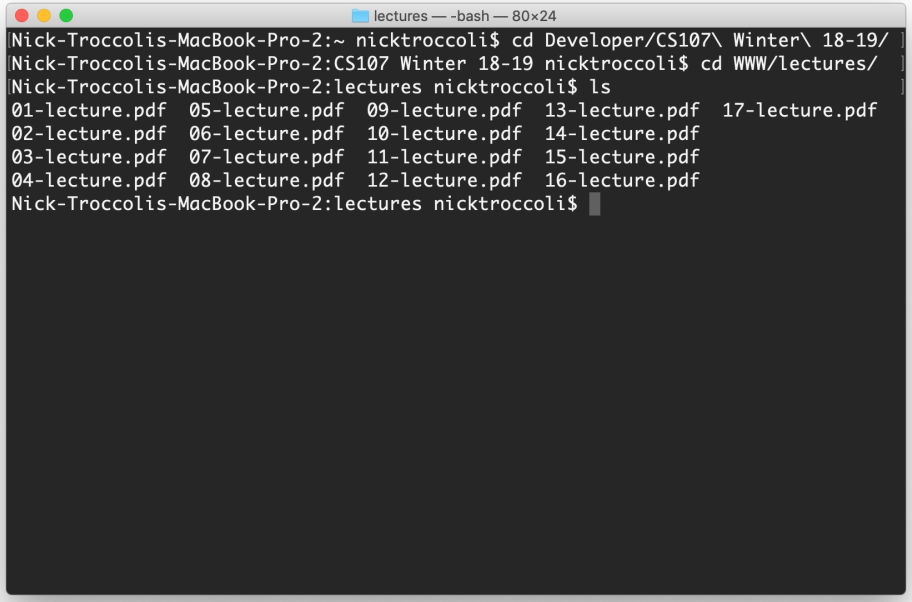
https://cs107.stanford.edu/collaboration

Plan For Today

- Introduction
- CS107 Course Topics
- CS107 Course Policies
- **Unix and the Command Line**

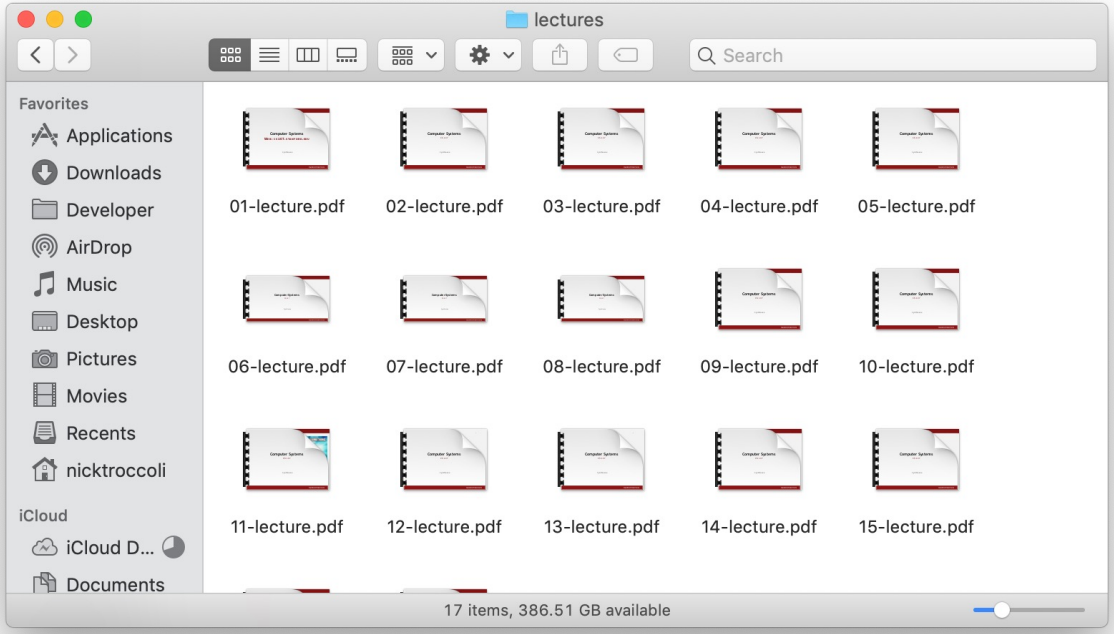
What is Unix?

- **Unix:** a set of standards and tools commonly used in software development.
  - **macOS** and **Linux** are operating systems built on top of Unix
- You can navigate a Unix system using the **command line** (“terminal”)
- Every Unix system works with the same tools and commands

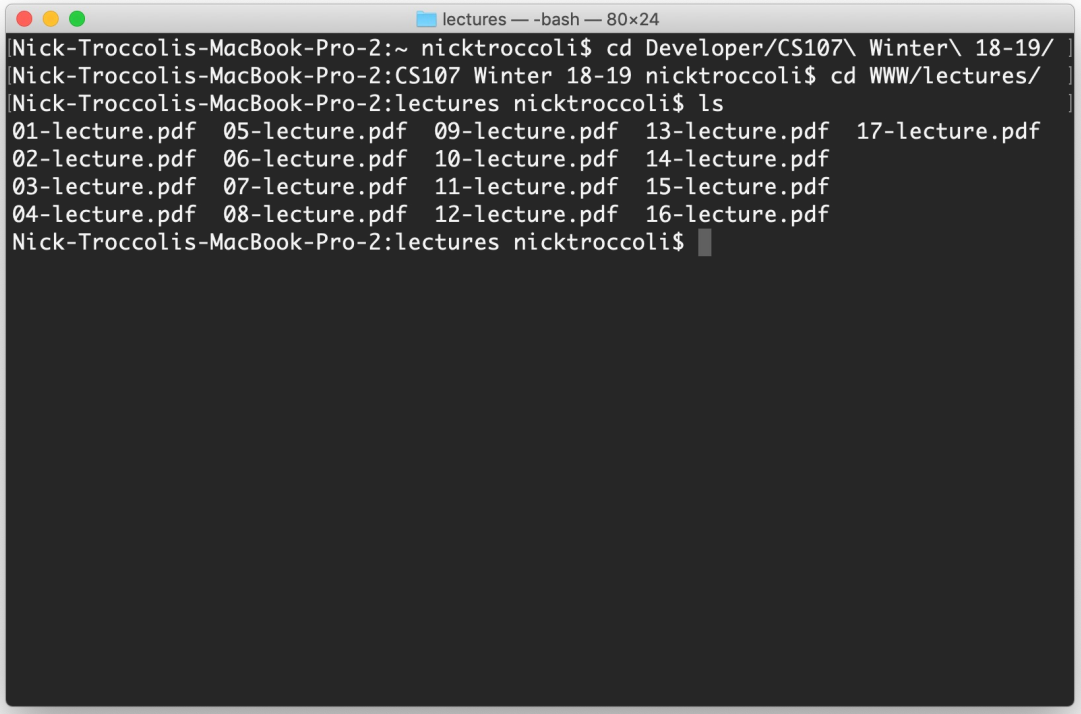


What is the Command Line?

- The **command-line** is a text-based interface (i.e., **terminal** interface) to navigate a computer, instead of a Graphical User Interface (GUI).



Graphical User Interface

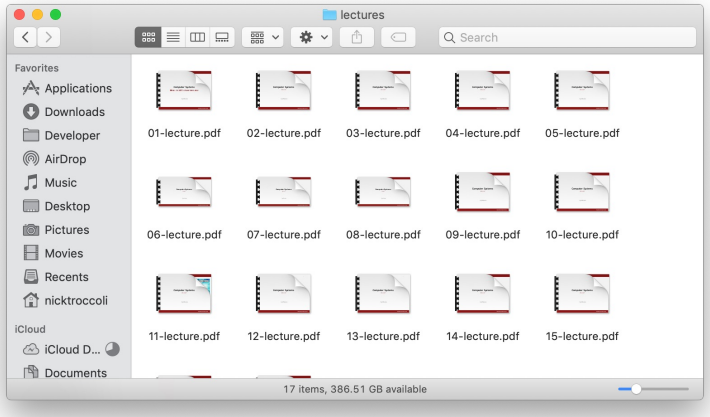


Text-based interface

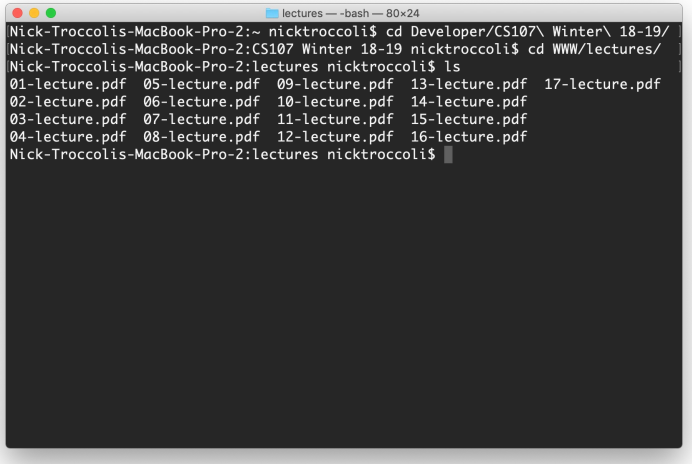
Command Line Vs. GUI

Just like a GUI file explorer interface, a terminal interface:

- shows you a **specific place** on your computer at any given time.
- lets you go **into folders** and **out of folders**.
- lets you **create new** files and **edit** files.
- lets you **execute programs**.



Graphical User Interface



Command-line interface

Why Use Unix / the Command Line?

- You can navigate almost any device using the same tools and commands:
  - Servers
  - Laptops and desktops
  - Embedded devices (Raspberry Pi, etc.)
  - Mobile Devices (Android, etc.)
- Used frequently by software engineers:
  - **Web development**: running servers and web tools on servers
  - **Machine learning**: processing data on servers, running algorithms
  - **Systems**: writing operating systems, networking code and embedded software
  - **Mobile Development**: running tools, managing libraries
  - And more…
- We'll use Unix and the command line to implement and execute our programs.

Learning Unix and the Command Line

- Using Unix and the command line can be intimidating at first:
  - It looks retro!
  - How do I know what to type?
- It's like learning a new language:
  - At first, you may have to constantly look things up (**resources** on course website!)
  - It's important to spend as much time as possible (during labs and assignments) building muscle memory with the tools

Recap

- CS107 is a programming class in C that teaches you about what goes on under the hood of programming languages and software.
- We'll use Unix and command line tools to write, debug and run our programs.
- Please visit the course website, cs107.stanford.edu, where you can read the General Information page, information about the Honor Code in CS107, and more about CS107 course policies and logistics.

We're looking forward to an awesome quarter!